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(71) Applicant: KONINKLIJKE PHILIPS ELECTRONICS N.V. [NL/NL]; Groenewoudseweg 1, NL–5621 BA Eindhoven (NL).

(71) Applicant *(for SE only)*: PHILIPS AB [SE/SE]; Kottbygatan 7, Kista, S–164 85 Stockholm (SE).

(72) Inventors: SUIJKER, Joseph, L., G.; Prof. Holstlaan 6, NL–5656 AA Eindhoven (NL). RAAS, Marinus, C.; Prof. Holstlaan 6, NL–5656 AA Eindhoven (NL).

(74) Agent: DUSSELDORP, Jan, C.; Prof. Holstlaan 6, NL–5656 AA Eindhoven (NL).

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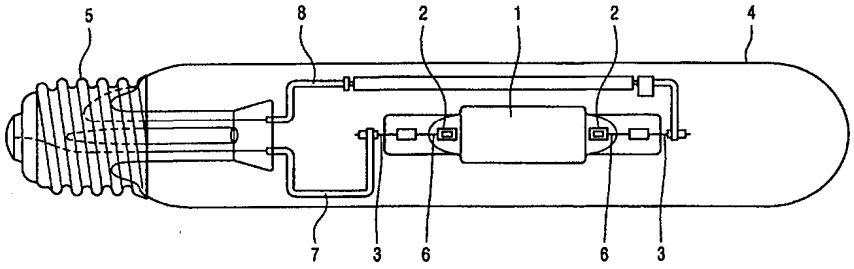
(54) Title: HIGH–PRESSURE METAL–HALIDE LAMP



(57) Abstract

The invention relates to a high–pressure metal–halide lamp comprising a discharge vessel with an ionizable filling containing one or more metals among which Hg, a halide and a rare gas, which vessel includes electrodes with a rod containing substantially W. The lamp, when in operation, maintains a W–halide cycle in the discharge vessel. According to the invention, the discharge vessel contains an oxygen dispenser.

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High-pressure metal-halide lamp.

The invention relates to a high-pressure metal-halide lamp provided with a discharge vessel with an ionizable filling containing one or more metals among which Hg, a halide and a rare gas, which vessel comprises electrodes with a rod containing substantially W, the lamp, when in operation, maintaining a W-halide cycle in the discharge vessel.

A lamp of the type defined in the opening paragraph is known from US 3,521,110. The known lamp, used as a light source of white light having a high luminous efficacy, has a discharge vessel with a wall of quartz glass. Other suitable wall material is ceramic. A ceramic wall is here understood to mean a refractive material such as monocrystalline metal oxide (for example, sapphire), polycrystalline metal oxide (for example, polycrystalline sintered aluminum oxide; yttrium aluminum garnet or yttrium oxide) and polycrystalline non-oxidic material (for example, aluminum nitride).

The occurrence of the W halide cycle is the cause for an extension of the useful life of the lamp, because there is avoided that W evaporated from the electrode deposits on the entire surface of the wall of the discharge vessel. A condition for the occurrence of the W-halide cycle is the presence in the discharge vessel of a small amount of free oxygen when the lamp is in operation. A free oxygen source is generally contaminations occurring during the manufacture of the lamp and released therefrom when the lamp is in the operating state. It has also been established that oxygen is released from the wall of the discharge vessel under the influence of reactions to filling components of the discharge vessel.

A disadvantage of the known lamp is that the amount of oxygen available in the discharge vessel in the operating state of the lamp is uncontrollable. In the case of too small a concentration, it will hardly be possible to maintain the W halide cycle sufficiently during the operation of the lamp. In the case of too large a concentration, there will be, inter alia, corrosion of the W-rod electrode. In view of an accuracy of manufacture required for a proper operation of the lamp, the chance of too small a concentration of oxygen is ever more becoming a problem.

In the literature it has been proposed indeed that oxygen is dosed in the filling, for example, in the form of oxyhalides such as, for example, niobium oxytrihalide (US 4,672,267) or in the form of HgO (US 3,720,855). A drawback of such dosings is that lamps

manufactured thus burn unstably even when molecular stabilizers are used. A further drawback is that HgO is poisonous. A serious drawback of the use of Nb is that it has the tendency of dissolving in W and thus lowering the melting point of the W electrode, as a result of which a stronger evaporation of W will occur. The presence of free oxygen in a non-ignited lamp has a disadvantageous influence on the ignition of the lamp and is thus to be avoided.

It is an object of the invention to provide a measure for combatting the described disadvantageous influence. For this purpose, a lamp according to the invention and of the type defined in the opening paragraph is characterized in that the discharge vessel contains an oxygen dispenser.

The lamp according to the invention is advantageous in that oxygen is fed to the discharge vessel in a controlled manner during the operation of the lamp. An additional advantage is that dosaging during the life of the lamp becomes possible. In a first advantageous embodiment of the lamp according to the invention, the oxygen dispenser contains WO_2. In a further advantageous embodiment of the lamp according to the invention, the oxygen dispenser contains CaO. Both WO_2 and CaO have the advantage that, when O_2 is supplied, elements are released which are commonly applied to discharge lamps, for example, as filling components. Preferably, an oxygen dispenser containing Ca0 is used in a lamp according to the invention with a ceramic discharge vessel. A surprising advantage of this lamp is that the Ca appears not only to maintain the W halide cycle, but also to deliver a spectral contribution both to red and in blue. Thus, a lamp can be manufactured which emits light that has a color temperature T_c of up to 3500K and a value for the general color rendition index R_a of over 80.

These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter.

In the drawings:

Fig. 1 shows a lamp according to the invention and

Fig. 2 shows a further lamp according to the invention.

The high-pressure metal halide discharge lamp shown in Fig. 1 has an gastight, light-transmissive discharge vessel 1, of quartz glass in the Figure. The discharge vessel has an ionizable filling of rare gas and metal halide. The filling of the lamp shown comprises

mercury, iodides of sodium, indium, thallium and a rare gas consisting of a mixture of 99.8% neon by volume and 0.2% krypton by volume with a filling pressure of 50mbar. The filling also has an oxygen dispenser containing WO_2, for example, in the form of a ceramic WO_2-impregnated carrier. Electrodes 2 in the discharge vessel each have a rod 6 substantially containing W, which rods are connected to conductors 3, of molybdenum in the Figure, which lead out through the discharge vessel to the exterior and are connected via electrical contacts 7 and 8 to a lamp base 5. The lamp shown has a hardglass outer bulb 4 carrying the lamp base 5. The lamp shown has a power consumption of 400W.

In the case of the lamp shown in Fig. 2, a metal halide lamp is represented with a cut-away view of a ceramic-wall discharge vessel 3, not shown to scale, enclosing a discharge space 11 which discharge space contains an ionizable filling which in the case shown contains not only Hg, but also Na- and Tl halide. The filling also contains an oxygen dispenser containing CaO, for example, in the form of a ceramic CaO-impregnated carrier. Two electrodes 4, 5 having electrode rods 44, 54 and tops 45, 55 are arranged in the discharge vessel and contain substantially W. The discharge vessel is closed on one side by a ceramic protruding plug 34, 35 which closely surrounds with clearance a lead-in 40, 41; 50, 51 respectively, to the electrode 4, 5 arranged in the discharge vessel and is connected thereto in a gastight manner by means of a melting-ceramic joint 10 adjacent an end turned away from the discharge vessel. The construction of the discharge vessel as shown in the Figure is known per se, for example, from EP-0 587 238. The discharge vessel is surrounded by an outer bulb 1 on one end having a lamp base 2. Between electrodes 4, 5 there is a discharge when the lamp is in operation. Electrode 4 is connected via a conductor 8 to a first electrical contact which forms part of the lamp base 2. Electrode 5 is connected via a conductor 9 to a second electrical contact which forms part of the lamp base 2.

In a practical embodiment of a lamp as described in Fig. 2, the nominal power of the lamp is 70W and the lamp has a nominal lamp voltage of 90V. The translucent wall of the discharge vessel has a thickness of 0.8mm. The inner diameter of the discharge vessel is 6.85mm, the distance between the electrode tops 7mm. The ionizable filling of the lamp contains in addition to 4.8mg Hg, 7mg (Na+Tl+Ca) jodide having a weight percentage composition of 28.8; 10.7 and 60.5. The discharge vessel also contains Ar as a start enhancer with a filling pressure of 300mbar. During the operation of the lamp, T_{kp} is 1210K. The lamp emits light with a specific luminous flux of 90lm/W for 100 hours. The color temperature T_c of the emitted light is 3150K. The general color rendering index R_a is 84.

CLAIMS:

1. A high-pressure metal-halide lamp, provided with a discharge vessel (1) with an ionizable filling containing one or more metals among which Hg, a halide and a rare gas, which vessel comprises electrodes (2) with a rod (6) containing substantially W, the lamp, when in operation, maintaining a W-halide cycle in the discharge vessel, characterized in that the discharge vessel contains an oxygen dispenser.

2. A lamp as claimed in claim 1, characterized in that the oxygen dispenser contains WO_2.

3. A lamp as claimed in claim 1, characterized in that the oxygen dispenser contains CaO.

4. A lamp as claimed in claim 3, characterized in that the discharge vessel is a ceramic discharge vessel (3).

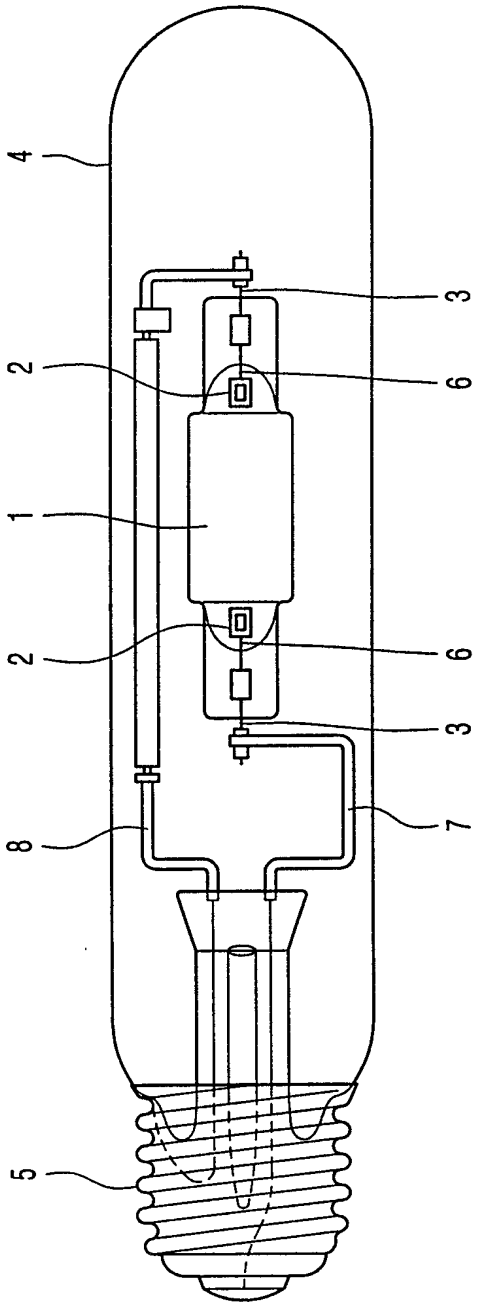

FIG. 1

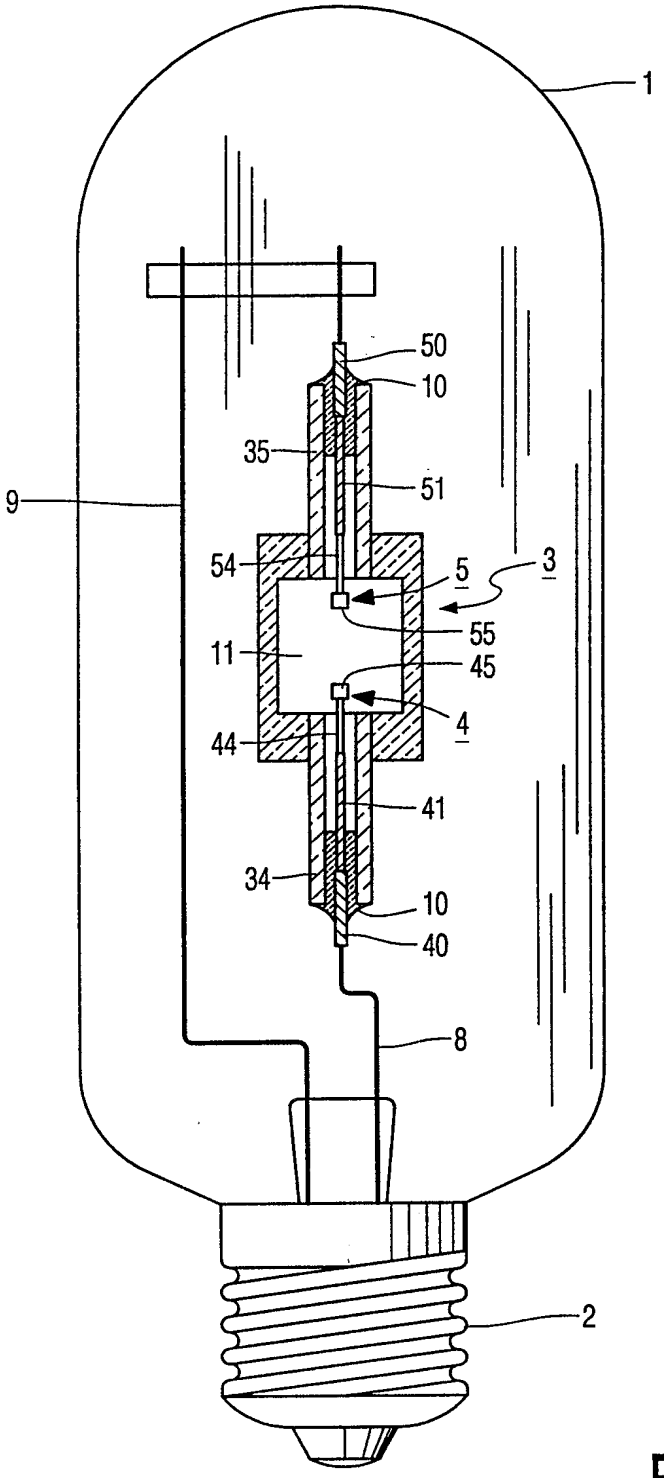

FIG. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB 99/00541

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H01J 61/28 // H01J 61/26
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H01J, H01K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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EPODOC, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4918352 A (HESS ET AL), 17 April 1990 (17.04.90), column 3, line 52 - line 65, claims 1, 2	1-4
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Y	US 5461281 A (FROMM ET AL), 24 October 1995 (24.10.95), column 2, line 32 - line 51; column 4, line 4 - line 9, figure 2	1
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Y	US 4620129 A (LUTHRA), 28 October 1986 (28.10.86), column 3, line 54 - line 61; column 5, line 35 - line 52, claims 1-6	2-4
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[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
30 July 1999	06 -08- 1999
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
D,Y	EP 0587238 A1 (PHILIPS ELECTRONICS N.V.), 16 March 1994 (16.03.94), abstract ---	4
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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